

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **88307891.7**

(51) Int. Cl.⁴: **E 04 H 15/48**

(22) Date of filing: **25.08.88**

(30) Priority: **26.08.87 US 89441**

(43) Date of publication of application:
01.03.89 Bulletin 89/09

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

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(54) Collapsible canopy with telescoping roof support structure.

(57) A canopy structure is provided and includes a framework unit (20) and a flexible covering. The framework unit (20) is formed by a plurality of upright corner members (22) and a plurality of roof support members (40) that are pivotally connected at the top ends (32) of the corner members (22) and, in an erected position, extended upwardly and inwardly to a central apex (50) where they are pivotally connected to one another. The roof support members (40) are formed of extendible sections which preferably telescope with respect to one another so that framework unit (20) may move into a collapsed state with the corner support (22) and roof support members (40) oriented in closely spaced, parallel relation. Latches are provided to prevent the framework unit from collapsing from the erected position. Constraining and support structure, preferably in the form of scissor assemblies (60), interconnect adjacent corner support members (22) to prevent them from moving apart past the erected state. The scissor assemblies (60) have one portion pivotally connected to the tops (32) of its associated corner supports (22) and another portion pivotally connected to slide brackets (34) on its associated corner support member (22). A cantilever member interconnects (70) each roof support member (40) and the slide bracket (34) on its associated corner support member (22). The central apex (50) may include a spring biased central post to

support the peak of the covering placed on the framework unit (20). Several framework units (20) may be formed together into a larger canopy structure.

Description

COLLAPSIBLE CANOPY WITH TELESCOPING ROOF SUPPORT STRUCTURE

BACKGROUND OF THE INVENTION

The present invention relates to a collapsible canopy structure which is readily portable so it may be used as a convenient shade screen or shelter, primarily for outdoor activities. As such, the present invention is directed to temporary shelters which may be stored in a collapsed state which may be used in an expanded state to provide a shelter having a large surface area of protection. The present invention specifically is directed to such shelter which includes a self-contained roof support structure that telescopically expands with the remaining support framework.

While portable shelters are known, there has recently been an increased need for greater sophistication in the quality and type of construction in portable shelter apparatus. One response to this need is shown in my U.S. Patent No. 4,641,676 issued 10 February 1987.

While the structure shown in this patent provides significant advantages, the scissor assemblies are under compressive forces. When the scissor assemblies are subjected to forces transversely of their plane, the combination of this force with the compressive force can result in substantial bowing of the scissor assemblies and distortion of the canopy framework. Additionally, the use of a central scissor assembly extending across the middle of the framework can be inconvenient in reducing the head room provided for persons sheltered by the canopy structure.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a new and useful canopy shelter which has increased head room and which can be collapsed for compact storage yet quickly and easily erected for use.

Another object of the present invention is to provide a collapsible canopy structure complete with a folding roof support structure that extends upwardly and inwardly of the corners of the canopy framework unit to an apex portion to support a canopy in a taut manner.

Yet a further object of the present invention is to provide a canopy structure that outwardly biases its corner support members so that the framework interconnecting adjacent corner support members is placed in tension rather than compression.

The canopy structure according to the present invention accordingly comprises a canopy framework unit that mounts a canopy top in order to provide a temporary shelter. The framework unit is readily collapsible for storage yet expandable for erection. The framework unit includes a plurality of

upright corner support members each of which having a bottom end which is positionable upon a support surface, such as the ground, a floor and the like, and a top end opposite the bottom end. These corner support members are oriented alongside one another in the collapsed state and are moved outwardly apart from one another in the expanded state.

A plurality of roof support members are pivotally connected to one another on first pivot axes at first ends thereof to define an apex located centrally of the canopy framework unit. The roof support members then project radially outwardly from the apex, preferably at equiangular locations and terminate at second ends which are each pivotally connected on a second pivot axis to the top end of a respective corner support member. Each corner support member and its associated roof support member thus may be folded about the second pivot axis into the collapsed state with the roof support members simultaneously being folded about the first pivot axes so that all of the roof support members and the corner support members may be oriented in closely spaced relation to one another.

Each roof support member includes a pair of extendible sections, such as telescoping members which are movable between a retracted state and when the canopy is in the collapsed state and an extended state when the canopy is in the extended state. The resultant roof support members are sized such that the apex is located above a plane defined by the top ends when the canopy structure is in the expanded state and when the roof support structures are in the extended state with the roof support members being oriented at an acute angle, preferably in the range of 15° to 45°, with respect to the plane.

Constraining and support means, such as scissor assemblies, are provided for preventing relative outward movement of the corner members past the expanded state and for maintaining lateral stability of the corner support members when they are in the expanded state. Latch means are associated with each of the roof support members to releasably retain the extendible sections in the extended state to prevent unwanted folding of the canopy structure into the collapsed state when so latched, that any downward force exerted on the apex exerts an outward force component tending to move the corner support members apart from one another against the constraining means.

A flexible covering is then sized to extend across and be supported by the roof support members to form a top for the canopy structure. The covering has perimeter edge portions extending between top ends of adjacent ones of the corner support members and a central peak portion which exerts a downward force on the apex when the covering is mounted on the canopy framework unit.

These and other objects of the present invention will become more readily appreciated and under-

stood from a consideration of the following detailed description of the preferred embodiment when taken together with the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a canopy structure according to the preferred embodiment of the present invention;

Figure 2 is a perspective view of the structural framework unit for the canopy structure shown in Figure 1;

Figure 3 is a side view in elevation of a top portion of a representative corner support member and roof support member which forms the canopy framework unit shown in Figure 2;

Figure 4 is a side view in elevation of the framework unit shown in Figure 2 approximately half way between the expanded state and the collapsed state;

Figure 5 shows a single corner support member and roof support member in the collapsed state;

Figure 6 is a side view in elevation showing the central post in a collapsed state;

Figure 7 is a side view in elevation showing a larger canopy framework constructed of two framework units;

Figure 8 is a perspective view of a framework unit according to the present invention utilizing a different geometrical configuration; and

Figure 9 is a top plan view of the alternate framework unit shown in Figure 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed toward a quick erectable canopy structure which includes a canopy covering and a canopy framework unit which is adapted to mount and position the canopy covering as a temporary shelter. Thus, the present invention is useful in creating a canopy assembly that may be stored in a compact, collapsed state yet which may be quickly and easily erected in an expanded state so that the canopy covering shelters a large surface area which provides shade and/or protection against rain.

As is shown in Figure 1, then, canopy structure 10 is shown in the expanded state and broadly includes a canopy covering 12 and a canopy framework 20. Canopy covering 12 has a central peak 14, and it is formed of top panels 16 and side panels 18. Covering 12 is supported by a canopy framework unit 20 which includes a plurality of corner support members 22. In Figure 1, the canopy structure is shown in the expanded state.

The construction of canopy framework unit 20 is best understood with reference to Figures 2 and 3. As is shown in these figures, canopy framework unit 20 includes four corner support members 22, each

of which is constructed of an upper telescoping member 24 and a lower telescoping member 26 which may be latched in selected relative extensions by button latches 27, shown in Figure 4, as is known in the art. Each of members 24 and 26 is preferably a tube having square-shaped cross section. Corner support members 22 accordingly define the edges of a geometrical configuration for the canopy structure. Thus, while it should be appreciated that Figures 1 through 6 describe a canopy having a generally cubic construction, other geometric configurations are within the scope of this invention. Canopy framework unit 20 is adapted to rest on a support surface. Accordingly, each corner support member 22 terminates in a foot 30 located at bottom end 28. Foot 30 rests on the support surface with each corner support member 22 being oriented in a generally upright, vertical position with respect to the support surface.

A plurality of roof support members 40 are provided, with each roof support member 40 extending from an upper end 32 of a respective corner post to terminate at an apex portion 50. Each adjacent corner support member 22 is interconnected to another by constraining and support means in the form of a scissor assembly 60 which is oriented in a vertical plane and comprises a pair of scissor units 62 connected in end-to-end relation. Each scissor unit 62 is formed by first and second cross pieces 64 and 66 which are pivotally connected to each other about their midpoints. An upper portion of each scissor assembly 60 is connected to each of its corner support members 22 at the top ends 32 thereof. Further, a lower portion of each scissor assembly 60 is connected to a slide bracket 34 which is slideably received on each respective corner post 22. A cantilever member 70 extends between each slide bracket 34 and an associated roof support member 40, as more thoroughly described below.

Each set consisting of a corner support member 22 and a corresponding roof support member 40 are constructed identically. Thus, for purposes of explanation, the description of a single such assembly may best be made with reference to Figure 3. In this figure, the top end 32 of a corner support member 22 is shown and is closed by a plastic end cap 33. A U-bracket 36 is mounted to corner support member 22 at top end 32 and a first L-bracket 38 is attached to corner support member 22 adjacent U-bracket 36. A slide bracket 34 is slideably received on corner support member 22 and both a second U-bracket 37 and a second L-bracket 39 is attached to slide bracket 34. As noted above, cross pieces 64 and 66 of a scissor unit 62 are pivotally connected to L-brackets 38 and 39 by pins 65 and 67, respectively.

Roof support member 40 is formed of a pair of extendible members, preferably in the form of an inner telescoping member 42 and an outer telescoping member 44 which telescopically receives member 42. Roof support member 40 projects radially inwardly to apex portion 50 so that an inner or a first end of roof support member 40 is pivotally secured to the apex portion, as described below. An outer or second end of roof support member 40 is formed by

means of a lower dog leg arm 46 that is received in the affixed to outer telescoping section 44. The other end of arm 46 is pivotally secured to U-bracket 36 by means of a pin 47.

At its ends opposite arms 46, outer telescoping member 44 has a downwardly projecting U-bracket 48. Cantilever member 70 is pivotally connected at one end to U-bracket 48 by pin 49 and at the other end to U-bracket 37 by means of pin 41. Thus, it should be appreciated that roof support member 40 may pivot downwardly with respect to corner support member 22 about pin 47. When this happens, slide bracket 47 moves downwardly and, accordingly, cantilever member 70 scissors so that roof support member 40 is oriented in closely spaced parallel relation alongside corner support member 22. It should be appreciated that lower dog leg arm 46 is provided to establish an offset to accommodate the width of U-brackets 37 and the width of cantilever member 70 between roof support member 40 and corner support member 22. To maintain telescoping members 42 and 44 in the extended position, shown in Figure 3, a latch means in the form of button latch and mating hole structure 45 is provided with the button latch 45 being located on one of the telescoping sections and the hole being located on the other telescoping section, as is standard construction known in the art.

As noted above, apex portion 50 is located at an end of roof support member 40 opposite corner support member 22. Apex portion 50 includes a center post assembly 52 which includes a cross bracket 54 that provides four pairs of ears, such as ears 55. The end of inner telescoping member 42 of roof support member 40 is thus pivotally connected between a pair of ears 55 by means of a pin 56, with this end terminating in an upper dog leg portion 43. Center post assembly 52 includes a post or upper member 58 that has a dome-shaped head 59. Upper member 58 is telescopically received in a lower member 72 that forms a housing for upper member 58 which is upwardly and outwardly biased by means of a spring 74; however, member 58 includes a post 76 received in slot 77 to prevent removal from member 72.

It should be appreciated from the foregoing that central post assembly 52 is vertically positioned along a central axis A which is vertical to the support surface. Each of upper ends 32 of corner support members 22 terminate in a common plane P which is transverse to axis A. In the preferred embodiment, in the expanded state shown in Figures 2 and 3, each of roof support members 40 are sized so that the apex portion 50 is located above plane P such that roof support members are oriented to an acute angle θ with respect to plane P. Preferably, this acute angle is in a range of 15° to 45° , inclusive, and it has been found particularly useful to select angle θ to be 30° .

As is shown in phantom in Figure 3, canopy covering 12 has side panel 18 which is additionally secured to a top portion of corner support member 22 by means of corresponding hook and loop fasteners, such as Velcro fasteners 35. Covering 12 then extends over upper end 32 of corner support

member 22 such that its top panel 16 extends upwardly to peak 14 that is defined by head 59 of corner post assembly 52. It should be appreciated that the restorative biasing of upper member 58 causes head 59 to maintain tension on canopy covering 12 so that top panels 16 are maintaining in a taut condition regardless of environmental conditions. Furthermore, the covering 12 also acts as constraining means to prevent over expansion of the canopy framework unit 20.

The expansion and contraction of canopy structure 10 can now be more fully appreciated with reference to Figures 2-5. When, in the erect or expanded state, shown in Figures 2 and 3, each of scissor assemblies 60 are in the full open position and telescoping members 42 and 44 are in the fully extended position and latched by means of the button latch 45. In this position, roof support member 40 is oriented at acute angle θ with respect to plane P. When the user desires to collapse canopy structure 10, the user depresses each of button latches 45 so that each of inner telescoping members 42 may slide into outer telescoping member 44. Once released, each roof support member 40 may pivot downwardly toward the respective corner support member 22. Due to the inner connection of cantilever 70 with slide bracket 34, slide bracket 34 moves downwardly towards bottom end 28 of corner support member 22. Since slide bracket 34 is connected to a lower portion of scissor assembly 60 at L-bracket 39, this causes each scissor assembly 60 to close. In order to accommodate this, each of scissor units 62 are pivotally secured at their centers and to each other at connections 68 and 69, respectively, as is shown in Figure 2.

As this downward or "collapsing" motion continues, canopy structure 10 is moved into the position shown in Figure 4. In this intermediate position, center post assembly 52 is adjacent plane Q of bottom ends 28 of corner support members 22 with each corner support member 22 and its respective roof support member 40 and cantilever member 70 being in a folded position. Corner support members 22 are then moved towards one another to further collapse canopy structure 10 until each corner support and roof support pair is in the position shown in Figure 5. In this position, each corner support member 22 and its respective roof support member 40 and cantilever member 70 are in closely spaced generally parallel relationship alongside one another. With reference to Figure 5 and Figure 6, it can be appreciated that upper dog leg portion 43 of each inner telescoping member 42 fold to provide an open region 80 to accommodate center post assembly 52, particularly dome-shaped head 59.

To reverse this process and erect canopy structure 10, the user simply moves each of corner support members 22 apart and then raises center post assembly 52 until it passes through plane P and can move up to in the fully expanded position with roof support members 40 partially extended. Canopy covering 12 is then positioned over canopy structure 10 with peak 14 oriented on head 59 and with side

panels 18 oriented alongside the vertical planes of each scissor assembly 60. To this end, it should be appreciated that side panels 18 and the top panel 16 form a plurality of pocket regions which receive upper end 32 of each corner support member 22. The mating Velcro fasteners on the inside of each of these pockets of side panels 18 are then secured to mating fasteners 35. After securing covering 12, the user then fully extends each roof support member 40 and latches the associated button latches 45 to maintain roof support members 40 in the fully extended position.

Due to the above-described mechanical structure, this latching of roof support members 40 in the fully extended position also prevents corner support members 22 from movement toward the collapsed position. By placing canopy covering 12 on roof support members 40, each of members 40 is placed in compression. This tends to expand, that is, force apart, each of corner support members 42 so that scissor assemblies 60 are placed in tension. Any downwardly directed force on apex 50 tends to slide bracket 34 downwardly due to its interconnection with cantilever 70 but such motion is resisted since scissor assemblies 60 cannot open, since opening them would draw corner support members 22 together. Thus, the mechanical forces of a canopy framework unit is in balance.

As noted above, it is possible to construct a canopy device in different geometrical configurations. Figures 7-9 show two alternate embodiments of the present invention showing different geometrical configurations. For example, Figure 7 shows a canopy device 108 which is constructed of a pair of canopy structure units 110 which are identical to canopy structure 10, described above. With respect to the embodiment shown in Figure 7, though, the pair of canopy framework units 110 share a pair of common corner support members, such as corner support member 123. Each corner support member 123 supports a pair of roof support member 140 and a pair of cantilever members 170 on a single slide bracket. Corner support members 122 support a single roof support member 140 and cantilever 170 in a manner similar to that described with respect to the preferred embodiment. A scissor assembly 160 interconnects each corner support member 122 and the corner support member 123. A larger canopy covering 112 (shown in phantom) is then positioned over canopy device 108 with canopy covering 112 having a pair of peaks 114 supported by the pair of center post assemblies 152.

A second alternate embodiment of the present invention is shown in Figures 8 and 9. In this embodiment, canopy device 210 is constructed as having a hexagonal configuration formed by six corner support members 222 which are each interconnected by a single scissor unit 262. It should be noted that, in the embodiment shown in Figures 8 and 9, there are six corner support members 222 but these corner support members position three roof support member 240 so that every other corner post 222 mounts a roof support member 240 by means of a cantilever member 270. While in this embodiment, as well as in the preferred embodiment, roof support

members are oriented in equiangularly spaced relation around the center post assembly such as center post assembly 252 and project radially outwardly therefrom, the preferred embodiment of the present invention had the corner support members and the roof support members in one-to-one correspondence while the embodiment shown in Figures 8 and 9 has corner support members and roof support members in two-to-one correspondence. In all other respects, though, the operation and construction of the alternate embodiment shown in Figures 8 and 9 is the same as that described with respect to the preferred embodiment.

Accordingly, the present invention has been described with some degree of particularity directed to the preferred embodiment of the present invention. It should be appreciated, though, that the present invention is defined by the following claims construed in light of the prior art so that modifications or changes may be made to the preferred embodiment of the present invention without departing from the inventive concepts contained herein.

Claims

1. A canopy structure adapted to be folded and stored in a collapsed state and erected in an expanded state on a support surface, comprising: a canopy framework unit including a plurality of upright corner support members each having a bottom end positionable on the support surface and a top end opposite the bottom end, said corner support members oriented alongside one another in the collapsed state and movable outwardly apart from one another toward the expanded state, a plurality of roof support members pivotally connected to one another on first pivot axes at first ends thereof to define an apex located centrally of said canopy unit, each said roof support member projecting radially outwardly from said apex to terminate at a second and pivotally connected on a second pivot axis to the top end of a respective corner support member whereby said roof support members and said corner support members form the canopy unit may be folded about said first and second pivot axes into the collapsed state with said roof support members and said corner support members oriented in closely spaced relation to one another, each said roof support member including a pair of extendible sections movable between a retracted state when said canopy structure is in the collapsed state and an extended state when said canopy structure is in the expanded state, said roof support members sized such that said apex is located above a plane defined by said top ends when the canopy structure is in the expanded state and said roof support members are in the extended state, said roof support members each oriented at an acute angle with respect to said plane, constraining and support means for preventing relative movement of said corner support members out-

wardly apart from one another past the expanded state and for maintaining lateral stability of the corner support members in the expanded state, and latch means associated with each said roof support member for releasably retaining the extendible sections of each respective roof support member in the extended state to prevent folding of the canopy structure into the collapsed state and whereby the downward force exerted on said apex exerts an outward force component tending to move said corner support members apart from one another against said constraining means; and a flexible covering sized to extend across the canopy framework unit and be supported by said roof support members to form a top for said canopy structure, said covering having perimeter edge portions extending between the top ends of adjacent ones of said corner support members and a central peak portion exerting a downward force on said apex.

2. A canopy structure according to claim 1 wherein said constraining means includes a frame-work structure extending between top end portions of each pair of adjacent corner support members.

3. A canopy structure according to claim 2 including a slide bracket slideably mounted on each of said corner support members and movable therealong, and wherein each framework structure is a scissor assembly having one portion pivotally connected to the top end of its associated corner support members and another portion pivotally connected to the slide brackets of its associated corner support members, said scissor assemblies each operative to open and close whereby the associated corner support members are caused to move away from and toward one another.

4. A canopy structure according to claim 3 including a plurality of cantilever members, there being a cantilever member pivotally connected at a first cantilever end to a respective roof support member and pivotally connected at a second cantilever end to the slide bracket on the corner support member to which the respective roof support member is connected whereby the cantilever members help support said roof support members and whereby pivotal movement of said roof support members acts to slide each of said slide brackets along its respective corner support member and correspondingly contract the scissor assemblies associated therewith.

5. A canopy structure according to claim 4 wherein outer end portions of said roof support members adjacent said second ends thereof are each provided with a lower dog leg whereby said corner support members, said cantilever members and said roof support members can be folded in closely spaced parallel relation to one another in the collapsed state.

6. A canopy structure according to claim 1 including a central post assembly pivotally connected to said first ends of said roof support members to define said apex, said central post assembly operative to support the central portion of said flexible covering.

7. A canopy structure according to claim 6

wherein said central post assembly includes a housing and a spring-loaded member biased upwardly against the central portion of said flexible covering.

8. A canopy structure according to claim 6 wherein said central post assembly terminates at an upper end thereof in a dome element operative to abut and support the central portion of said flexible covering.

9. A canopy structure according to claim 8 wherein inner end portions of said roof support members adjacent said first ends thereof are each provided with an upper dog leg whereby said roof support members may be folded alongside and parallel one another around said dome element as said canopy structure is folded into the collapsed state.

10. A canopy structure according to claim 1 wherein said constraining means is formed by said flexible covering.

11. A canopy structure according to claim 10 wherein said flexible covering includes side panels that extend downwardly from said perimeter edge portions, adjacent ones of said side panel portions having vertical edges attached to one another to form corner pocket regions that receive top end portions of said corner support members.

12. A canopy structure according to claim 1 wherein each said roof support member is formed by inner and outer telescoping sections.

13. A canopy structure according to claim 12 wherein the outer telescoping sections are each pivotally connected to a respective corner support member.

14. A canopy structure according to claim 13 wherein said latch means includes a button latch on one of said telescoping sections and a hole sized to receive the button latch on the other of said telescoping sections.

15. A canopy structure according to claim 1 including a plurality of cantilever members, there being a cantilever member pivotally connected at a first cantilever end to each of said roof support members and pivotally connected at a second cantilever end to a slide bracket slideably received on the corner support member associated with the respective roof support member whereby pivotal movement of said roof support members correspondingly slides said slide brackets along said corner support members.

16. A canopy structure according to claim 1 wherein said acute angle is in the range of 15° to 45°.

17. A canopy structure according to claim 1 wherein said corner support members are formed by a plurality of telescoping members whereby the height of said corner support members may be selectively adjusted and including releasable locking means for retaining each said corner support port at the selected height.

18. A canopy structure according to claim 1, including a plurality of canopy framework units interconnected to one another to construct a larger canopy structure, some of said canopy units having common corner support members, said flexible

covering extending over the larger canopy structure and having a plurality of peak portions positioned to receive the apices of the canopy units.

19. A canopy structure adapted to be stored in a collapsed state and erected in an exposed state on a generally horizontal support surface, comprising: an apex portion located on a vertical central axis above said support surface:

a plurality of upright corner support members parallel to and equiangularly spaced around said central axis in parallel relation thereto, said corner support members each having a bottom end positionable on said support surface and a top end opposite said bottom end with said top ends being located in a common plane that is transverse to said central axis, said corner support members oriented in closely spaced relation alongside one another in the collapsed state and movable outwardly from said central axis and apart from one another toward the expanded state and defining outer corner edges of a structural unit having a selected geometrical configuration in the expanded state;

a plurality of roof support members having first ends pivotally connected on first pivot axes to said apex portion and extending radially outwardly from said central axis at equiangular locations to terminate at second ends, each said second end being pivotally connected on a second pivot axis to the top end of a respective corner support member, each said roof support member including a pair of telescoping sections movable between a retracted state when the canopy unit is in the collapsed state and an extended state when said canopy unit is in the expanded state, whereby said roof support members and said corner support members which form the canopy unit may be folded about said first and second pivot axes into the collapsed state with said roof support members and said corner support members or oriented in closely spaced relation to one another;

a flexible covering sized to extend across and be supported by said roof support members to form a top for said canopy structure, said covering having perimeter edge portions extending between the top ends of adjacent ones of said corner support members;

latch means associated with each said roof support member for releasably retaining the extendible sections of each respective roof support member in the extended state to prevent folding of the canopy structure into the collapsed state; and
constraining and support means acting against said outward force component for preventing relative movement of said corner support members outwardly apart from one another past the expanded state and for stabilizing said corner support members to maintain them in parallel relation to the central axis in the expanded state.

20. A canopy structure according to claim 19 including a slide bracket slideably mounted on each of said corner support member, said constraining and support means including a scissor assembly having one portion pivotally connected to the top end of its associated corner support members and another portion pivotally connected to the slide

brackets of its associated corner support members, said scissor assemblies each operative to expand and contract whereby its associated corner support members are caused to move away from and toward one another.

21. A canopy structure according to claim 20 including a plurality of cantilever members, there being a cantilever member pivotally connected at a first cantilever end to a respective roof support member and pivotally connected at a second cantilever end to the slide bracket on the corner support member to which the respective roof support member is connected whereby pivotal movement of said roof support member acts to slide each of said slide brackets along its respective corner support member and correspondingly contract the scissor assemblies associated therewith.

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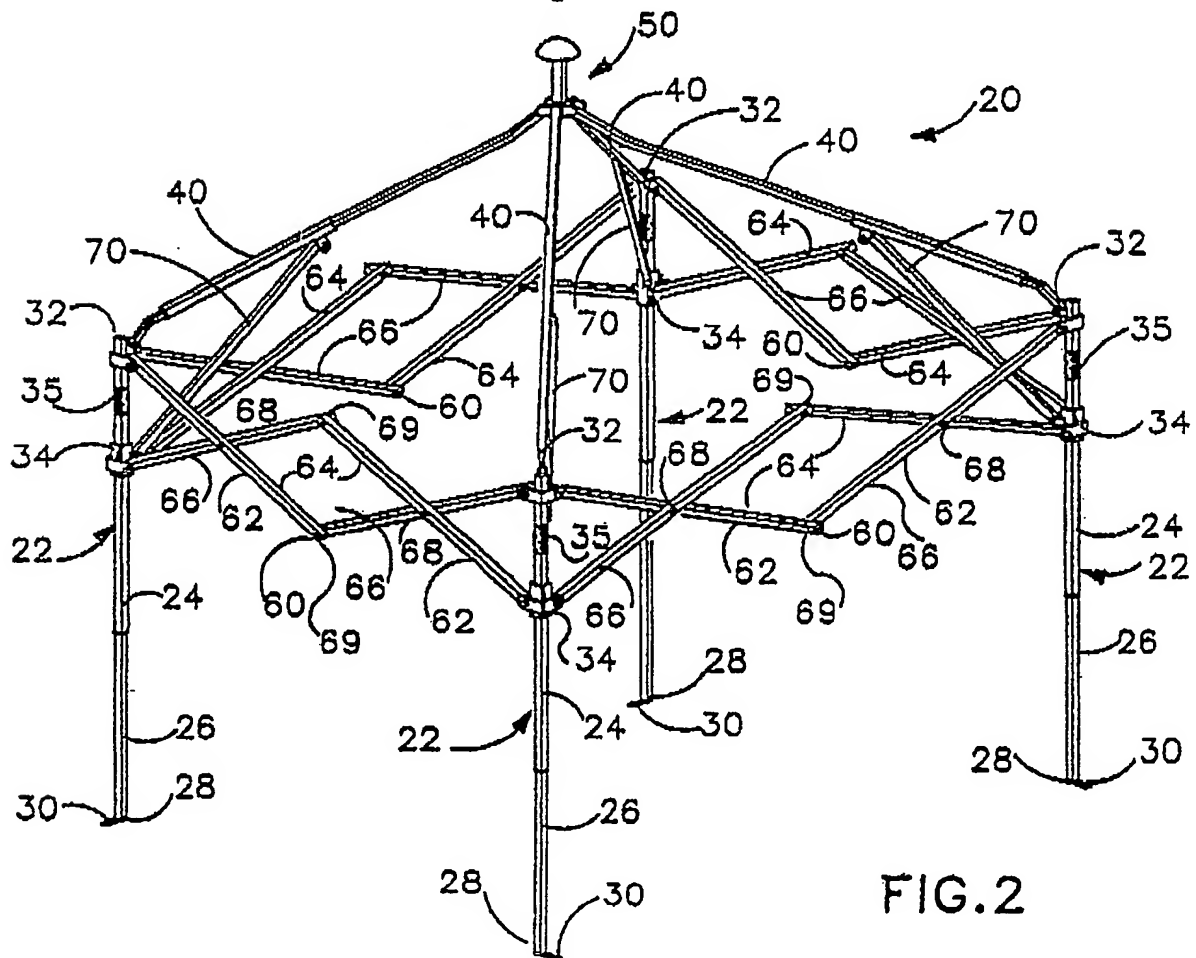
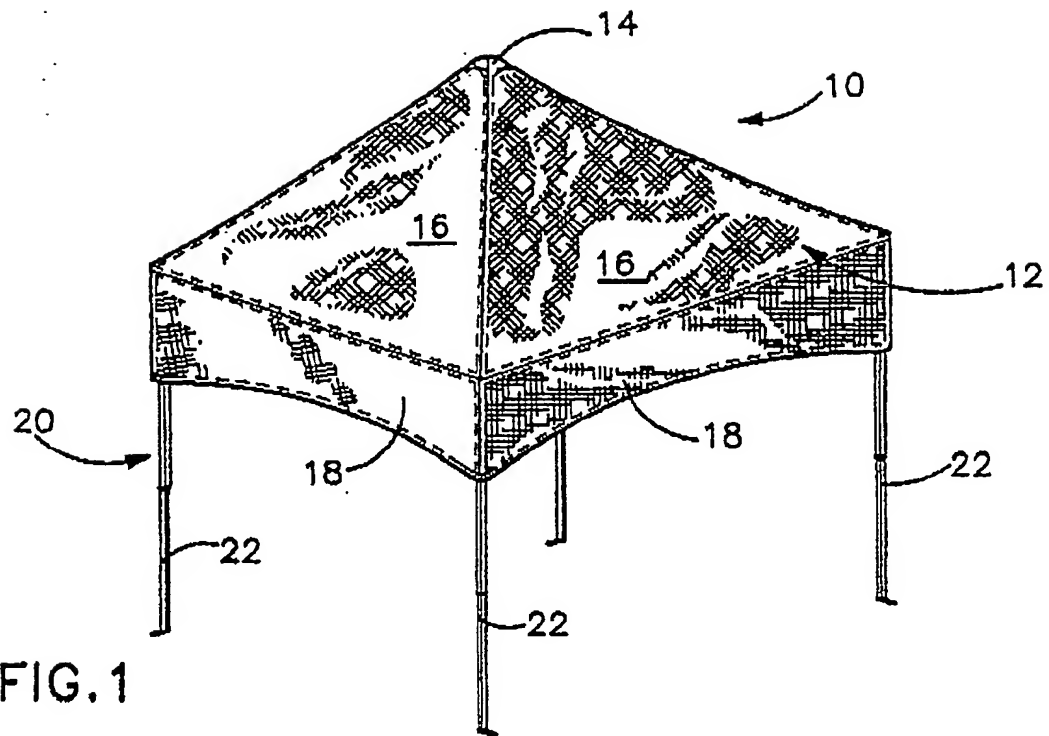
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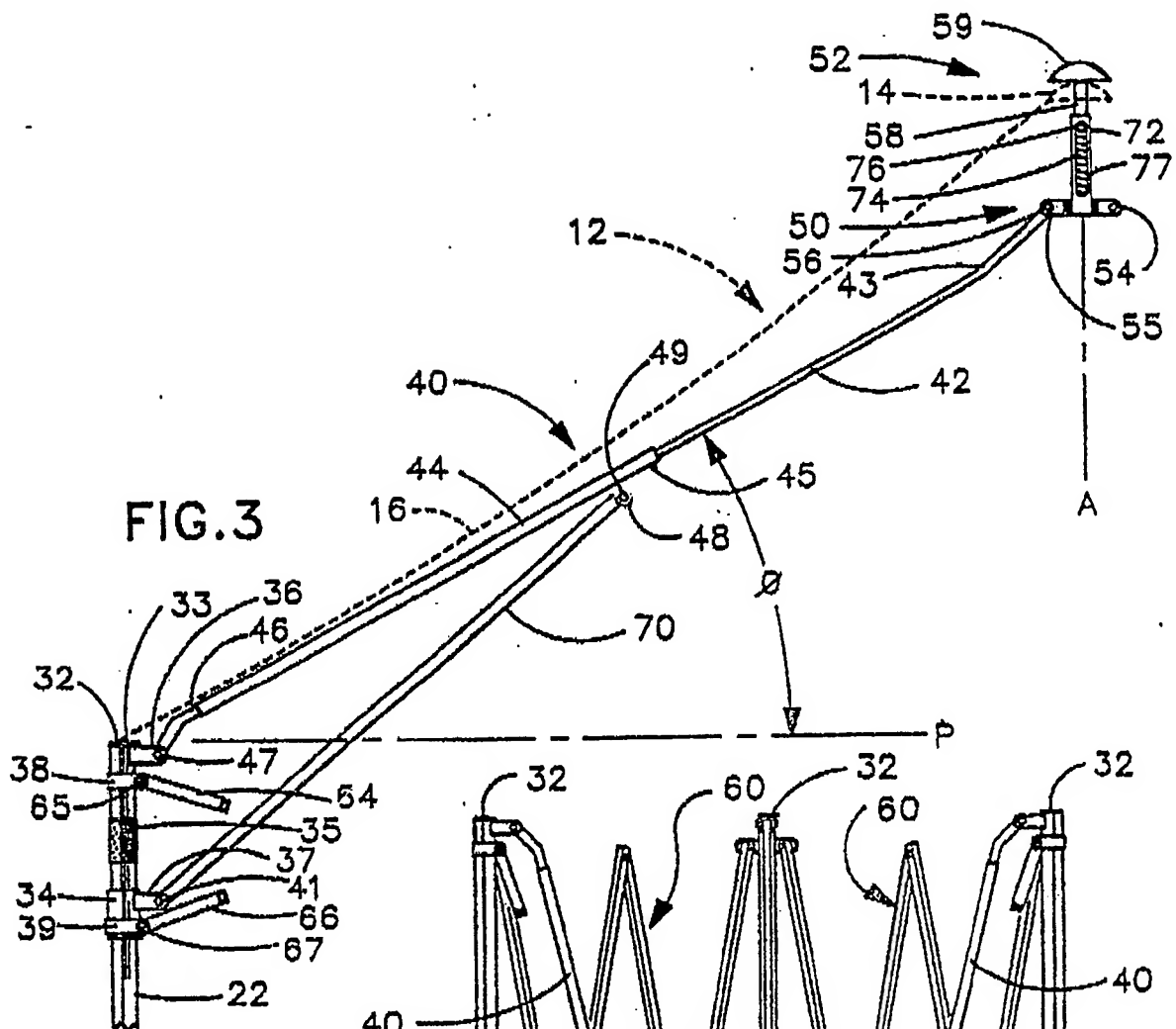
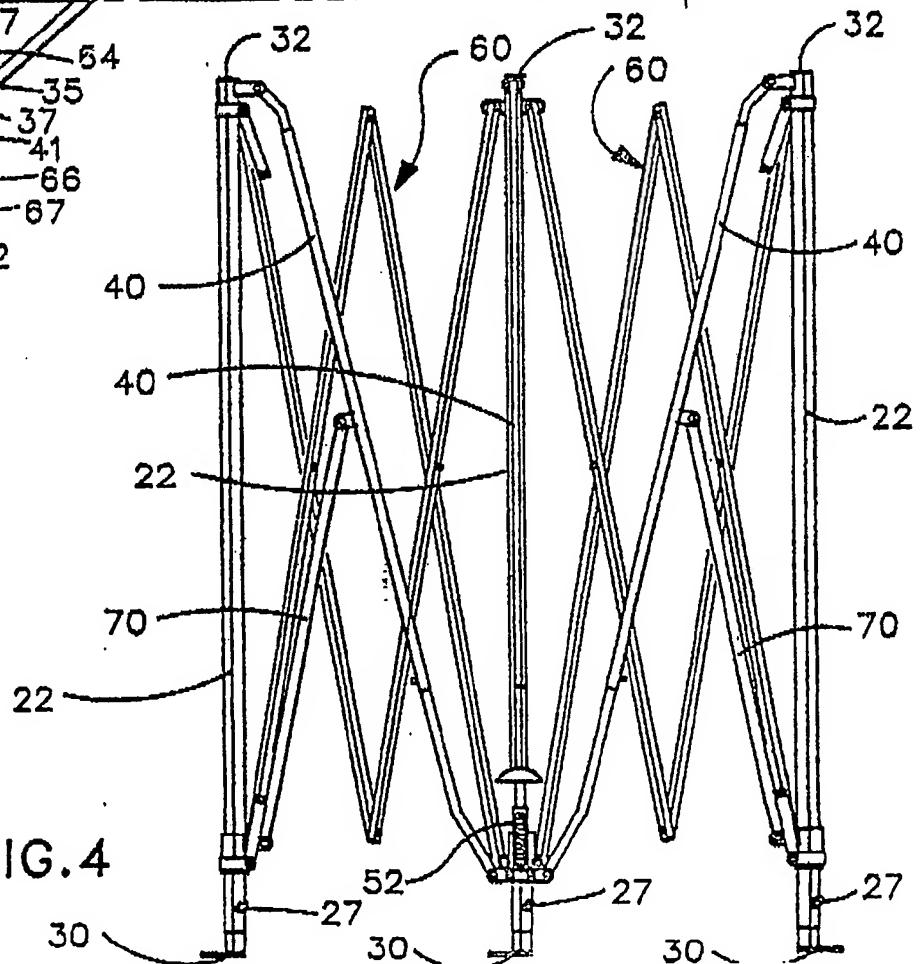


FIG. 4



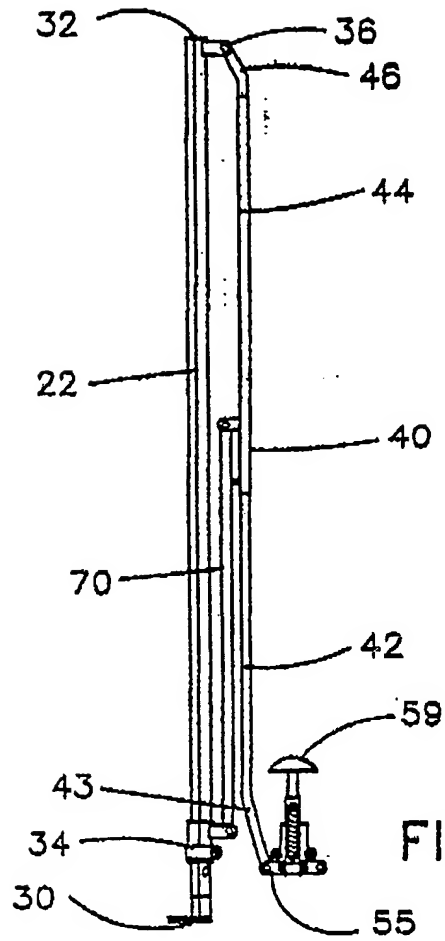


FIG. 5

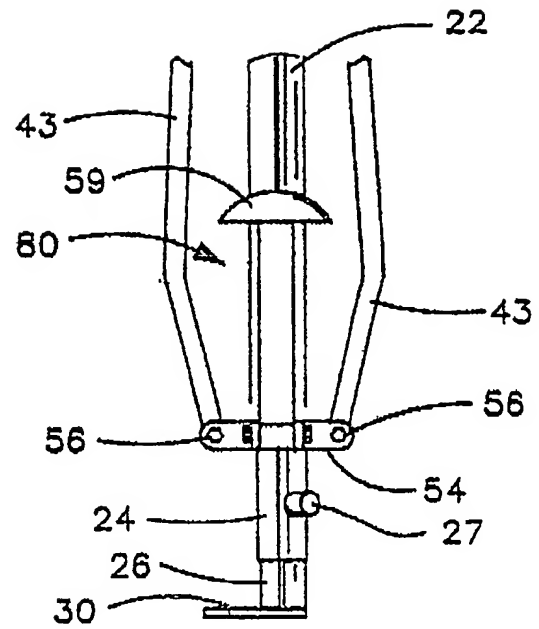
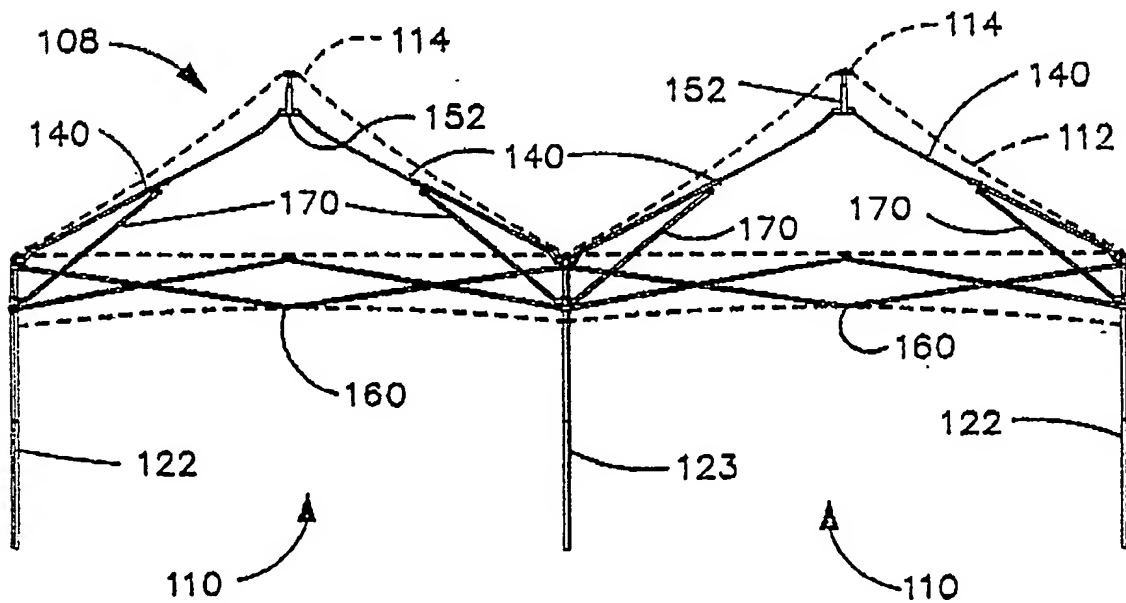
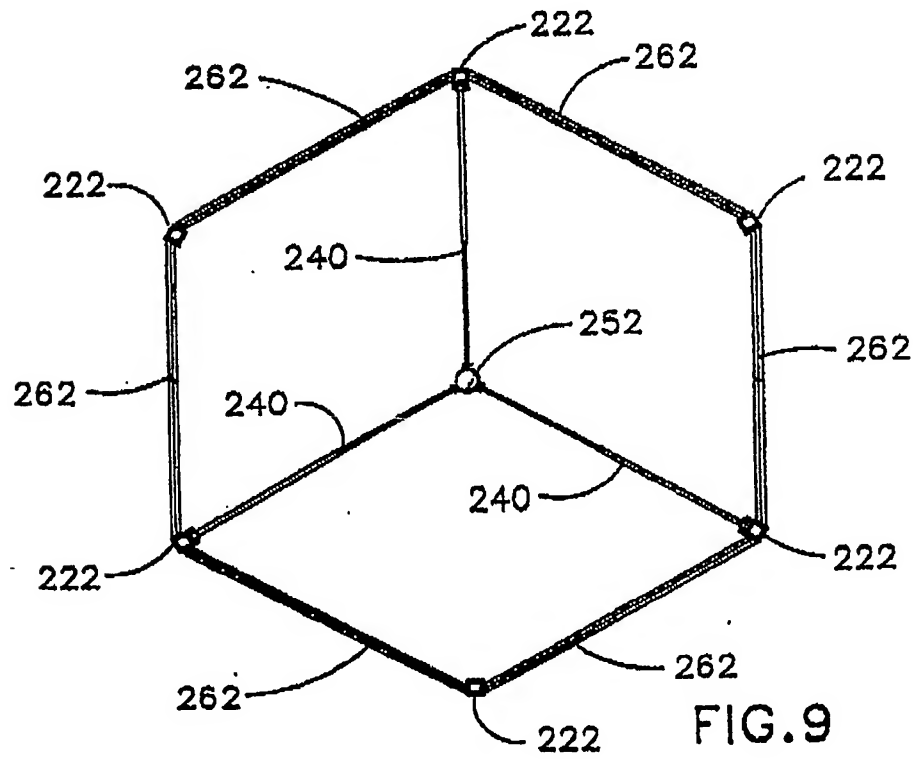
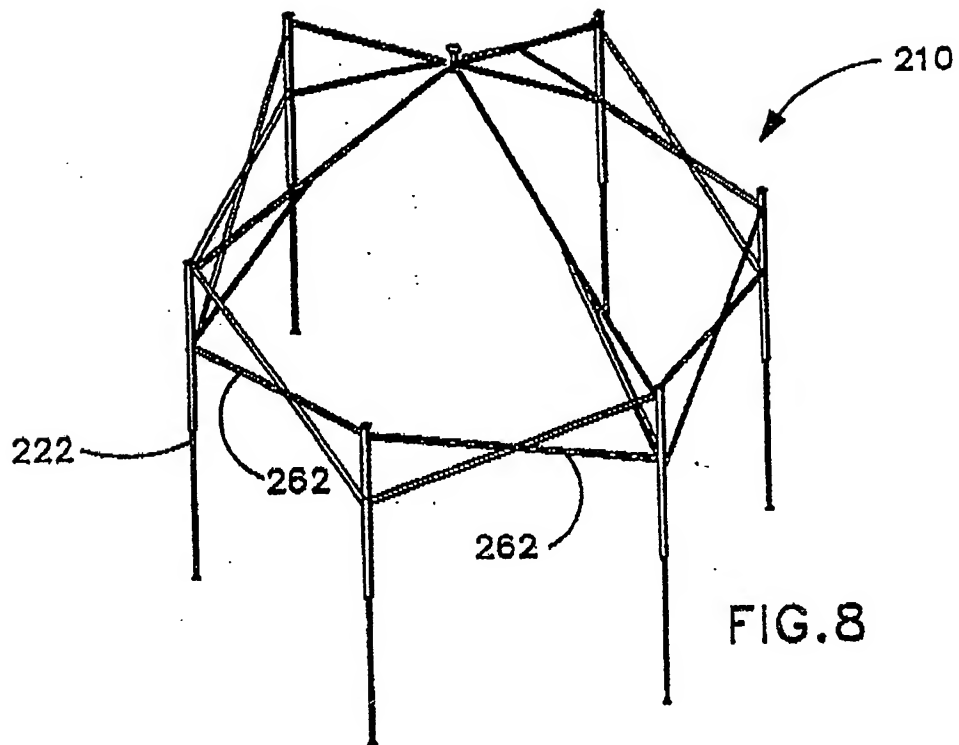


FIG. 6







European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 30 7891

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-1 853 367 (MACE) * Page 1, line 49 - page 2, line 29; figures *	1,2,5,6 ,8,9,12 ,13,16, 17,19	E 04 H 15/48
A	FR-A-1 187 739 (MOREL) * Page 1, left-hand column, line 27 - right-hand column, line 24; figures *	3	
A	FR-A-2 349 298 (PINTO et al.) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			E 04 H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11-11-1988	Examiner LAUE F.M.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document			